

Notice of Allowability	Application No.	Applicant(s)	
	10/092,994	DOUCEUR ET AL.	
	Examiner	Art Unit	
	Cam Y T. Truong	2162	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/25/2005.
2. ☒ The allowed claim(s) is/are 1-4,6-9,11,19-24,26,27,31-38,42,43 and 45.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. <input type="checkbox"/> Notice of References Cited (PTO-892) 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date <u>10/25/05 & 5/12/05, 10/13/05, 1/3/05</u>. 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | <ol style="list-style-type: none"> 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance 9. <input type="checkbox"/> Other _____. |
|---|--|

DETAILED ACTION

1. Applicant has amended claims 1 and 36 in the amendment filed on 10/25/2005. Claims 1-48 are pending in this office action.

Drawings

2. Drawing filed on 3/7/2005 is accepted.

Information Disclosure Statement

3. Information Disclosure Statement (IDS) filed on 10/13/05, 1/31/05, 10/25/05 and 5/12/2005 are considered.

EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Allan T. Sponseller, Reg.No. 38,318 on 11/7/2005.

Please replace claims 1-2, 4, 6-8, 11, 19, 20, 26-27, 31, 33, 36, 38, 42, 43, and 45 with claims 1-2, 4, 6-8, 11, 19, 20, 26-27, 31, 33, 36, 38, 42, 43, and 45.

Please cancel claims 5, 10, 12-18, 25, 28-30, 39-41, 44, and 46-48.

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1. (Currently amended) A computer implemented method for determining location to store object replicas, the method comprising:

receiving an indication of a homeless replica of an object, wherein the object has a plurality of replicas including the homeless replica, wherein the object is a file;

determining an initial placement for the homeless replica, wherein the initial placement is one of a plurality of devices in a system;

evaluating, on an object by object basis, whether any replicas of a first object can be swapped with one of a plurality of replicas of a second object and not reduce a combined object availability of the first and second objects, wherein the first object is selected as one of a plurality of objects managed by a first computing device having a lowest object availability, and the second object is selected as one of another plurality of objects managed by a second computing device having a highest file availability, wherein the evaluating comprises:

determining, for each possible swapping of replicas of the objects, an object availability for each object; and

checking whether any of the possible swappings result in the combined object availability of the first and second objects that is greater than a combined object availability; and

swapping a replica of the first object with the one of the plurality of replicas of the second object only if the swapping does not reduce the combined object availability of the first and second objects, wherein the swapping results in

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increasing an availability of the first object and decreasing an availability of the second object.

2. (Currently amended) A method as recited in claim 1, wherein the replica of the first object is stored on the first computing device, wherein the one of the plurality of replicas of the second object is stored on the second computing device, and wherein swapping the replicas comprises moving the replica of the first object to the second computing device and moving the one of the plurality of replicas of the second object to the first computing device.

4. (Currently amended) A method as recited in claim 1, wherein both the first object and the second object have a same amount of replicas.

6. (Currently amended) A method as recited in claim 1, wherein the object represents a plurality of files.

7. (Currently amended) A method as recited in claim 1, wherein the object represents a portion of a file.

8. (Currently amended) A method as recited in claim 1, wherein the object represents a directory.

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11. (Currently amended) A method as recited in claim 1, wherein combined object availability is not reduced if the availability of the first object and the availability of the second object are no further from one another than they were prior to the evaluating.

19. (Currently amended) One or more computer readable media having stored thereon a plurality of instructions that, when executed by one or more processors of a computing device for determining location to store file replicas, causes the one or more processors to perform acts comprising:

receiving an indication of a homeless replica of a file, wherein the file has a plurality of replicas including the homeless replica;

determining an initial placement for the homeless replica, on one of a plurality of additional computing devices;

working, in conjunction with one or more other processors of another computing device, to determine whether a replica of a first file managed by a first computing device and a replica of a second file managed by a second computing device can be swapped with one another to bring an availability of the first file and an availability of the second file closer, wherein the first file is selected as one of a plurality of files managed by the first computing device having a lowest file availability, and the second file is selected as one of another plurality of files managed by the second computing device having a highest file availability;

evaluating, on a file by file basis, whether any replicas of the first file can be swapped with one of a plurality of replicas of the second file and not reduce a

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combined file availability of the first and second files, wherein the evaluating comprises:

determining, for each possible swapping of replicas of the files, a file availability for each file;

checking whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and

swapping the replica of the first file and the replica of the second file only if the swapping brings the availability of the first file and the availability of the second file closer, wherein the swapping results in increasing the availability of the first file and decreasing the availability of the second file.

20. (Currently amended) One or more computer readable media as recited in claim 19, wherein the swapping comprises communicating with a first device on which the replica of the first file is stored and a second device on which the replica of the second file is stored to have the first device transfer the replica of the first file to the second device and delete the replica of the first file on the first device, and to have the second device transfer the replica of the second file to the first device and delete the replica of the second file on the second device.

26. (Currently amended) One or more computer readable media as recited in claim 19, wherein determining the initial placement comprises randomly selecting the initial placement for the homeless replica.

27. (Currently amended) One or more computer readable media as recited in claim 19, wherein the plurality of additional computing devices exclude any computing device on which a replica of the file is already stored.

31. (Currently amended) One or more computer readable media as recited in claim 19, wherein the first computing device is part of a directory group that is collectively responsible for managing a plurality of files including the first file, and wherein the second computing device is part of another directory group that is collectively responsible for managing another plurality of files including the second file.

33. (Currently amended) A computer implemented serverless distributed file system for determining location to store file replicas comprising:

- a first plurality of computing devices storing files;

- a second plurality of computing devices managing storage of the files;

- wherein a first computing device of the second plurality of computing devices selects a first file for which it manages storage and communicates with a second computing device of the second plurality of computing devices to determine whether a replica of the first file and a replica of a second file for which the second computing device manages storage can be swapped in order to not reduce a combined file availability of the first and second files, wherein the first file is selected as one of a plurality of files managed by the first computing device

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having a lowest file availability, and second file is selected as one of another plurality of files managed by the second computing device having a highest file availability;

wherein at least one of the second plurality of computing devices determines, for each possible swapping of replicas of the files, a file availability for each file, and checks whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and

if the replicas can be swapped to not reduce the combined file availability of the first and second files, then instructing one of the first plurality of computing devices on which the replica of the first file is stored to transfer the replica of the first file to one of the first plurality of computing devices on which the replica of the second file is stored, instructing the one of the first plurality of computing devices on which the replica of the second file is stored to transfer the replica of the second file to the one of the first plurality of computing devices on which the replica of the first file is stored, and

wherein the transfer of the replica of the first file to the one of the first plurality of computing devices on which the replica of the second file is stored and the transfer of the replica of the second file to the one of the first plurality of computing devices on which the replica of the first file is stored results in increasing an availability of the first file and decreasing an availability of the second file.

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36. (Currently amended) One or more computer readable media having stored thereon a plurality of instructions that is executed by one or more processors of a computing device for determining location to store file replicas, causing the one or more processors to:

- receive an indication of a homeless replicas of a file;

- initially place the homeless replicas of the file on different ones of a plurality of devices using a first process; and

- subsequently improve placement of replicas of a plurality of files by:

- evaluating, on a file by file basis, whether any replicas of a first file can be swapped with any replicas of a second file without a reduction in a combined file availability of the first and second files, wherein the first file is selected as one of a plurality of files managed by a first computing device having a lowest file availability, and the second file is selected as one of another plurality of files managed by a second computing device having a highest file availability, wherein the evaluating comprises:

- determining, for each possible swapping of replicas of the files, a file availability for each file; and

- checking whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and

- swapping a replica of the first file with a replica of the second file if the swapping results in no reduction in the combined file availability of the first and

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second files, wherein the swapping results in increasing an availability of the first file and decreasing an availability of the second file.

38. (Currently amended) One or more computer readable media as recited in claim 36, wherein swapping the replica of the first file with the replica of the second file comprises communicating with a first device on which the replica of the first file is stored and a second device on which the replica of the second file is stored to have the first device transfer the replica of the first file to the second device and delete the replica of the first file on the first device, and to have the second device transfer the replica of the second file to the first device and delete the replica of the second file on the second device.

42. (Currently amended) A computer implemented method in a directory group for determining location to store file replicas, the method comprising:

- selecting other directory group to participate with in a replica placement process;

- selecting a first file maintained by the directory group;

- determining whether exchanging a replica of the first file with a replica of a second file maintained by the other directory group increases a combined file availability of the first and second files, wherein the first file is selected as one of a plurality of files managed by the directory group having a lowest file availability, and the second file is selected as one of another plurality of files managed by the other directory group having a highest file availability;

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evaluating, on a file by file basis, whether any replicas of the first file can be swapped with one of a plurality of replicas of the second file and not reduce the combined file availability of the first and second files, wherein the evaluating comprises:

determining, for each possible swapping of replicas of the files, a file availability for each file; and

checking whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and

having the replica of the first file and the replica of the second file exchanged if exchanging the replicas increases the combined file availability of the first and second files, wherein the exchange results in increasing an availability of the first file and decreasing an availability of the second file.

43. (Currently amended) A method as recited in claim 42, further comprising:

receiving, at the directory group, an indication of a homeless replica of the first file; and

selecting, as a computing device on which to store the homeless replica, one of a plurality of computing devices on which no other replica of the first file is already stored.

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45. (Currently amended) A method as recited in claim 42, wherein having the replica of the first file and the replica of the second file exchanged comprises communicating with a first device on which the replica of the first file is stored and a second device on which the replica of the second file is stored to have the first device transfer the replica of the first file to the second device and delete the replica of the first file on the first device, and to have the second device transfer the replica of the second file to the first device and delete the replica of the second file on the second device.

Allowable Subject Matter

5. Claims 1-4, 6-9, 11, 19-24, 26, 27, 31-38, 42, 43 and 45 are allowed.

The prior art of record, alone or in combination, does not teach or fairly suggest the combination of steps as recited in independent claim 1 wherein "evaluating, on an object by object basis, whether any replicas of a first object can be swapped with one of a plurality of replicas of a second object and not reduce a combined object availability of the first and second objects; checking whether any of the possible swappings result in the combined object availability of the first and second objects that is greater than a combined object availability; and wherein the swapping results in increasing an availability of the first object and decreasing an availability of the second object";

The prior art of record, alone or in combination, does not teach or fairly suggest the combination of steps as recited in independent claim 19 "to determine whether a replica of a first file managed by a first computing device and a replica of a second file managed by a second computing device can be swapped with one another to bring an availability of the first file and an availability of the second file closer; checking whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and wherein the exchange results in increasing an availability of the first file and decreasing an availability of the second file";

The prior art of record, alone or in combination, does not teach or fairly suggest the combination of steps as recited in independent claim 33 “to determine whether a replica of the first file and a replica of a second file for which the second computing device manages storage can be swapped in order to not reduce a combined file availability of the first and second files; checks whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and results in increasing an availability of the first file and decreasing an availability of the second file”;

The prior art of record, alone or in combination, does not teach or fairly suggest the combination of steps as recited in independent claim 36 “evaluating, on a file by file basis, whether any replicas of a first file can be swapped with any replicas of a second file without a reduction in the combined file availability of the first and second files; checking whether any of the possible swappings result in the combined file availability of the first and second files that is greater than a combined file availability; and wherein the exchange results in increasing an availability of the first file and decreasing an availability of the second file”; and

The prior art of record, alone or in combination, does not teach or fairly suggest the combination of steps as recited in independent claim 42 “evaluating, on a file by file basis, whether any replicas of the first file can be swapped with one of a plurality of replicas of the second file and not reduce a combined file availability of the first and second files; checking whether any of the possible swappings result in the combined file availability of the first and second files that

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is greater than a combined file availability; and wherein the exchange results in increasing an availability of the first file and decreasing an availability of the second file”.

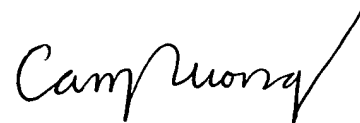
The dependent claims, bring definite, further limiting, and fully enabled by the specification are also allowed.

Contact Information

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cam Y T. Truong whose telephone number is (571) 272-4042. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Cam Y T Truong
Examiner
Art Unit 2162
11/8/2005